



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : B26D 3/02, 5/08, 7/26		A1	(11) International Publication Number: WO 00/00329 (43) International Publication Date: 6 January 2000 (06.01.00)
<p>(21) International Application Number: PCT/US99/14738</p> <p>(22) International Filing Date: 29 June 1999 (29.06.99)</p> <p>(30) Priority Data: 60/091,213 30 June 1998 (30.06.98) US 60/118,365 3 February 1999 (03.02.99) US</p> <p>(71) Applicant (for all designated States except US): INTERFACE, INC. [US/US]; Suite 2000, 2859 Paces Ferry Road, Atlanta, GA 30339 (US).</p> <p>(72) Inventors; and (75) Inventors/Applicants (for US only): SCOTT, Graham, A. [US/US]; 6144 Old West Point Road, LaGrange, GA 30240 (US). BRADFORD, John [US/US]; 228 Baywood Circle, LaGrange, GA 30240 (US). NOLES, William, G. [US/US]; 145 Wilcox Road, LaGrange, GA 30241 (US).</p> <p>(74) Agents: PRATT, John, S. et al.; Kilpatrick Stockton LLP, Suite 2800, 1100 Peachtree Street, Atlanta, GA 30309-4530 (US).</p>			
<p>(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p>Published With international search report.</p>			
<p>(54) Title: ULTRASONIC FLOOR COVERING CUTTING AND SEAMING DEVICE AND METHOD</p> <p>(57) Abstract</p> <p>An ultrasonic floor covering cutting and seaming device (2) including a body having an ultrasonic trim knife (12) and a foot assembly (10). The foot assembly includes a collar (16) and a mounting bracket adjustably attached to the ultrasonic device. The mounting bracket tilts the device and blade in the direction of the cut and permits it also to be tilted to either side to make a variety of cuts, such as angled, vertical, or "square" cuts.</p>			

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ULTRASONIC FLOOR COVERING CUTTING AND SEAMING DEVICE AND METHOD

RELATED APPLICATIONS

5 This application claims priority to U.S. provisional patent applications, serial number 60/091,213 entitled "Ultrasonic Seaming for Installation of Low Profile Flooring," filed June 30, 1998 and serial number 60/118,365 entitled "Ultrasonic Floor Covering Cutting and Seaming Device and Method," filed February 3, 1999, which are incorporated by reference herein.

10 **FIELD OF THE INVENTION**

This invention relates in general to the field of carpet and other floor covering cutting and seaming.

BACKGROUND OF THE INVENTION

Recently developed flooring coverings are considerably thinner than and structurally different from conventional carpet. Some of such floor coverings employ underlying structural layers on top of which is positioned a decorative fabric woven on a Jacquard-type computer controlled loom. As is true during installation of other types of roll goods flooring, it is necessary in the course of installing this floor covering to establish seams between adjacent pieces of flooring and to form such seams in the field during installation.

It is relatively easy to form unobtrusive seams in conventional carpet having a pile surface because pile in adjacent pieces of carpet can be worked together to reduce visibility of the seam. By contrast, formation of unobtrusive seams in thinner floor covering, particularly such products having a woven top surface without upstanding pile, is far more challenging.

SUMMARY OF THE INVENTION

This invention includes systems and methods for an ultrasonic floor covering cutting and seaming device including a body having an ultrasonic knife blade attached thereto and a foot assembly adjustably affixed to the body. The foot assembly further includes a collar affixed to the foot assembly and an upright plate

affixed to the collar. A mounting bracket rotatably affixes to the upright plate such that the ultrasonic cutting and seaming device provides for angular cuts of the floor coverings. The mounting bracket tilts the ultrasonic cutting and seaming device and blade in the direction of the cut and permits it also to be tilted to either side to make 5 an angled cut (or a vertical, "square" cut if desired).

Preferably, an ultrasonic trim knife model no. 159-085053 available from Branson Ultrasonics Corporation of Danbury, Connecticut, United States of America, provides for successful cutting and seaming of such woven-face floor covering. Utilizing the ultrasonic cutting and seaming device of this invention for 10 cutting rolled goods floor covering provides for a precision cut, an adjustable guide for making a straight cut and adjustment of angles and heights. Cutting on an angle provides for more surface area of the flooring to seal together. This provides a tighter seal which functions as a moisture barrier so that moisture cannot get under the seal and cause deterioration of the floor covering. Slight relative movement of 15 adjacent pieces of floor covering cut at an angle also will be less noticeable.

Objects of this invention include:

- To provide a device that provides a precise cut of roll goods floor covering.
- To provide a device that is transportable and usable on-site during installation of roll goods floor covering.
- 20 To provide a device that provides for adjustment of the angle of the cut.
- To provide a device that provides for adjustment of the depth of the cut.
- To provide a device that cuts on an angle.

As the following description and accompanying drawings make clear, these and other objects are achieved by this invention.

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BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of a foot assembly attached to an ultrasonic cutting and seaming device of this invention.

Fig. 2 shows a cross-sectional view of a seam cut made by the ultrasonic cutting and seaming device of Fig. 1.

Fig. 3 shows an exploded perspective view of the foot assembly of Fig. 1 (without the height micro-adjustment mechanism).

Fig. 4 shows a side view of an alternative embodiment of an ultrasonic cutting and seaming device of this invention.

5 Fig. 5 shows a rear view of the ultrasonic cutting and seaming device of Fig. 4.

DETAILED DESCRIPTION OF THE INVENTION

Fig. 1 shows a perspective view of a foot assembly attached to an ultrasonic device 2 of this invention. The device 2 includes a foot assembly 10, and an 10 ultrasonic knife body 11 having a ultrasonic knife blade 12 attached thereto. This knife blade 12 used together with a foot assembly 10 as depicted in Fig. 1 provides for a precise cut of roll goods floor covering 14.

As will be seen by reference to the figures, the foot assembly 10 uses collar 16 attached to an upright plate 18. The upright plate 18 is attached to the mounting 15 bracket 20 in a manner such that the device 2 provides for square or angular cuts of the floor covering 14. The graph 22 illustrates a range of motion achievable by the device 2 when providing angle cuts.

The mounting bracket 20 includes two feet 24 that straddle an open space 26 through which the ultrasonic knife blade 12 protrudes. Depth of cut can be adjusted 20 by sliding the ultrasonic knife body 11 within collar 16. Fine adjustments in body 11 position within collar 16 may be made utilizing a micro adjustment mechanism provided, for instance, by rotating a knob 28 having a threaded shaft 30 that threads through the collar 16 and attaches to a stop plate 32 attached to the body 11. The depth of the cut must be carefully adjusted and controlled to fully penetrate the floor 25 covering 14 while avoiding contact between the knife blade 12 and floor, which can destroy the blade.

The foot 24 of the device 2 is drawn along a straight edge 34 to achieve a straight cut 38.

Fig. 2 shows a cross-sectional view of a seam cut 39 made by the ultrasonic 30 device 2 of Fig. 1 set as illustrated in Fig. 1 to cut on an angle. A vertical cut of the

floor covering 14 would achieve a cut thickness T1. However, an angular cut achieves a thickness T2. Thickness T2 is greater than thickness T1. Thus, cutting on an angle using this invention increases the surface area of the floor covering 14 which provides for a tighter seal between floor covering edges and also reduces 5 seam visibility.

Fig. 3 shows an exploded perspective view of the foot assembly 10 of Fig. 1. The foot assembly 10 includes the collar 16 attached to the upright plate 18 that is attached to the mounting bracket 20 by two set screws 40, 42. The mounting bracket 20 includes slots 44, 46 for receiving and rotatably affixing the upright plate 10 18 to the mounting bracket 20 using the set screws 40, 42. Adjusting the set screws 40, 42, provides for rotating and securing the mounting bracket 20 to different angles. Screws 48, 50 affix the collar 16 to the body 11 and provide for attachment to bodies 11 having different diameters.

Figure 4 shows an alternative embodiment of an ultrasonic seaming and 15 cutting device of this invention. As will be seen by reference to the Figure 4, an ultrasonic trim knife blade 59 works with a positioning clamp 60. The positioning clamp 60 uses an L-shaped member 62 having an upright plate 64 attached to two feet 66 that straddle an open space 68 through which the ultrasonic knife blade 59 protrudes. The ultrasonic knife body 71 is grasped by a clamping ring 72 that 20 provides height adjustment and pivots on a pivot rod 74 that forms a hinge attachment to a leg 76 that lies against and attaches to upright plate 64.

As can be understood by reference to both Figure 4 and Figure 5, this arrangement allows the inclination of the ultrasonic knife body 71 (indicated by arrow 82) to be adjusted by tilting the clamping ring 72. The tilt of the entire 25 ultrasonic knife body 71 (indicated by arrow 84) may be adjusted by pivoting leg 76 about pivot point 88 (shown in Figure 5).

Floor covering seaming utilizing the ultrasonic knife 12 in a foot assembly 10 may be accomplished by:

- 1) Dry lay floor covering with overlap, ensuring that roll to roll matching is 30 consistent.

- 2) Cut-in along walls and around obstructions.
- 3) Double-cut seams. Use the ultrasonic knife 12 for this task.
- 4) Full spread floor covering adhesive a half roll width both sides of seam line using a notched trowel.
- 5) Lay one side into wet adhesive and apply a seam sealer to the installed edge.
- 6) Lay adjacent sheet into wet adhesive, tuck seam and bump up tight with a knee kicker.
- 7) Remove any excess floor covering adhesive or sealer from the surface of the seam.
- 10 8) Repeat procedure for remainder of the installation.
- 9) Use weighted roller as necessary.
The floor covering may be R.R.R. Protector 5000 or R.R.R. NexStep Adhesive or other suitable adhesive; and the seam sealer may be R.R.R. Seam Sealer, or other suitable seam sealer. All R.R.R. products are available from
- 15 Rockland React-Rite, Inc., 327 Industrial Dr., Rockmart, Georgia, United States of America, 30153-3520.
- 20 While certain embodiments of this invention have been described above, these descriptions are given for purposes of illustration and explanation. Variations, changes, modifications and departures from the systems and methods disclosed above may be adopted without departure from the spirit and scope of this invention.

Claims:

- 1 1. A device for cutting and seaming floor coverings, comprising:
 - 2 an ultrasonic knife body having an ultrasonic knife blade attached thereto;
 - 3 and
 - 4 a foot assembly adjustably affixed to the ultrasonic knife body.
- 1 2. The device of claim 1 wherein the foot assembly further comprises a collar
2 affixed to the foot assembly.
- 1 3. The device of claim 2, further comprising an upright plate affixed to the
2 collar.
- 1 4. The device of claim 3, further comprising a mounting bracket rotatably
2 affixed to the upright plate such that the device provides for angular cuts of the floor
3 coverings.
- 1 5. The device of claim 3 wherein the mounting bracket further comprises feet
2 that straddle an open space in the mounting bracket through which the ultrasonic
3 knife blade protrudes.
- 1 6. The device of claim 3 wherein the mounting bracket further comprises set
2 screws received through slots for receiving and rotatably affixing the upright plate
3 to the mounting bracket.
- 1 7. The device of claim 2, further comprising screws affixing the collar to the
2 ultrasonic knife body and provide for attachment to bodies of a variety of diameters.
- 1 8. The device of claim 3, further comprising a knob having a threaded shaft that
2 threads through the collar and attaches to a stop plate attached to the ultrasonic knife
3 body for adjusting the device to penetrate the floor covering while avoiding
4 contacting a sub-floor.

1 9. A method for cutting and seaming low profile floor coverings, comprising:
2 laying the low profile floor covering on a floor so that one piece of the low
3 profile floor covering overlaps another adjacent piece of low profile floor covering;
4 cutting through the overlapped low profile floor covering utilizing an
5 ultrasonic knife to produce a cut edge on each piece of low profile floor covering;
6 and

7 bonding the low profile floor covering to the floor so that the cut edge of the
8 one piece of low profile floor covering abuts the cut edge of the other piece of low
9 profile floor covering.

1 10. The method of claim 9, further comprising applying a seam sealer to seams
2 of adjacent low profile floor coverings.

1 11. The method of claim 9, further comprising adjusting the depth of cuts by
2 sliding the body within the collar.

1 12. The method of claim 9, further comprising rotating a knob to cause the body
2 to slide within the collar to adjust the depth of a cut.

1 13. A device for cutting and seaming low profile floor coverings, comprising:
2 an ultrasonic knife body having an ultrasonic knife blade attached thereto;
3 a foot assembly adjustably affixed to the ultrasonic knife body;
4 a collar affixed to the foot assembly;
5 an upright plate affixed to the collar; and
6 a mounting bracket rotatably affixed to the upright plate.

1 14. The device of claim 13, wherein the mounting bracket further comprises a
2 foot with toes that straddle an open space through which the ultrasonic knife blade
3 protrudes.

1 15. The device of claim 13, further comprising a knob having a threaded shaft
2 that threads through the collar and attaches to a stop plate attached to the ultrasonic
3 knife body for adjusting the device to penetrate the low profile floor coverings while
4 avoiding contacting a sub-surface.

1 16. The device of claim 13, wherein the mounting bracket further comprises set
2 screws received through slots in the mounting bracket for rotatably affixing the
3 upright plate to the mounting bracket.

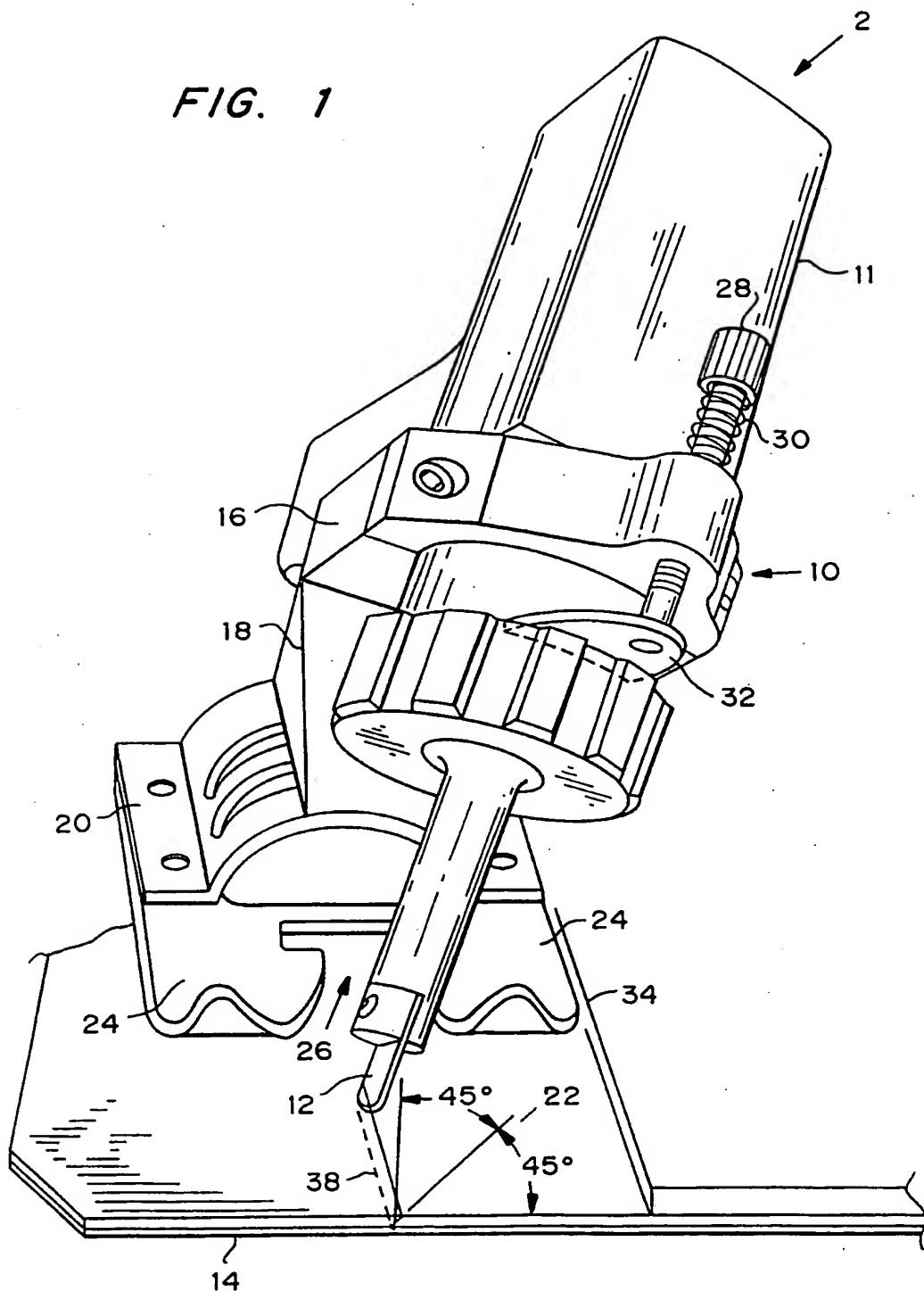
1 17. The device of claim 13 further comprising screws for affixing the collar to
2 ultrasonic knife bodies of multiple sizes.

1 18. A device for ultrasonic seaming of low profile flooring, comprising;
2 an ultrasonic trim knife;
3 a positioning clamp pivotedly connected to the ultrasonic trim knife, the
4 positioning clamp pivots to provide height adjustment of the ultrasonic trim knife.

1 19. The device of claim 18, further comprising:
2 a body enclosing the ultrasonic trim knife leaving a blade on the ultrasonic
3 trim knife exposed.

1 20. The device of claim 19, wherein the positioning clamp further comprises an
2 L-shaped member having an upright plate attached to two feet straddling an open
3 space through which the blade protrudes.

1 21. The device of claim 20, wherein the position clamp further comprises a pivot
2 rod that forms a hinge attachment to a leg that lies against and attaches to the
3 upright plate.

FIG. 1**SUBSTITUTE SHEET (RULE 26)**

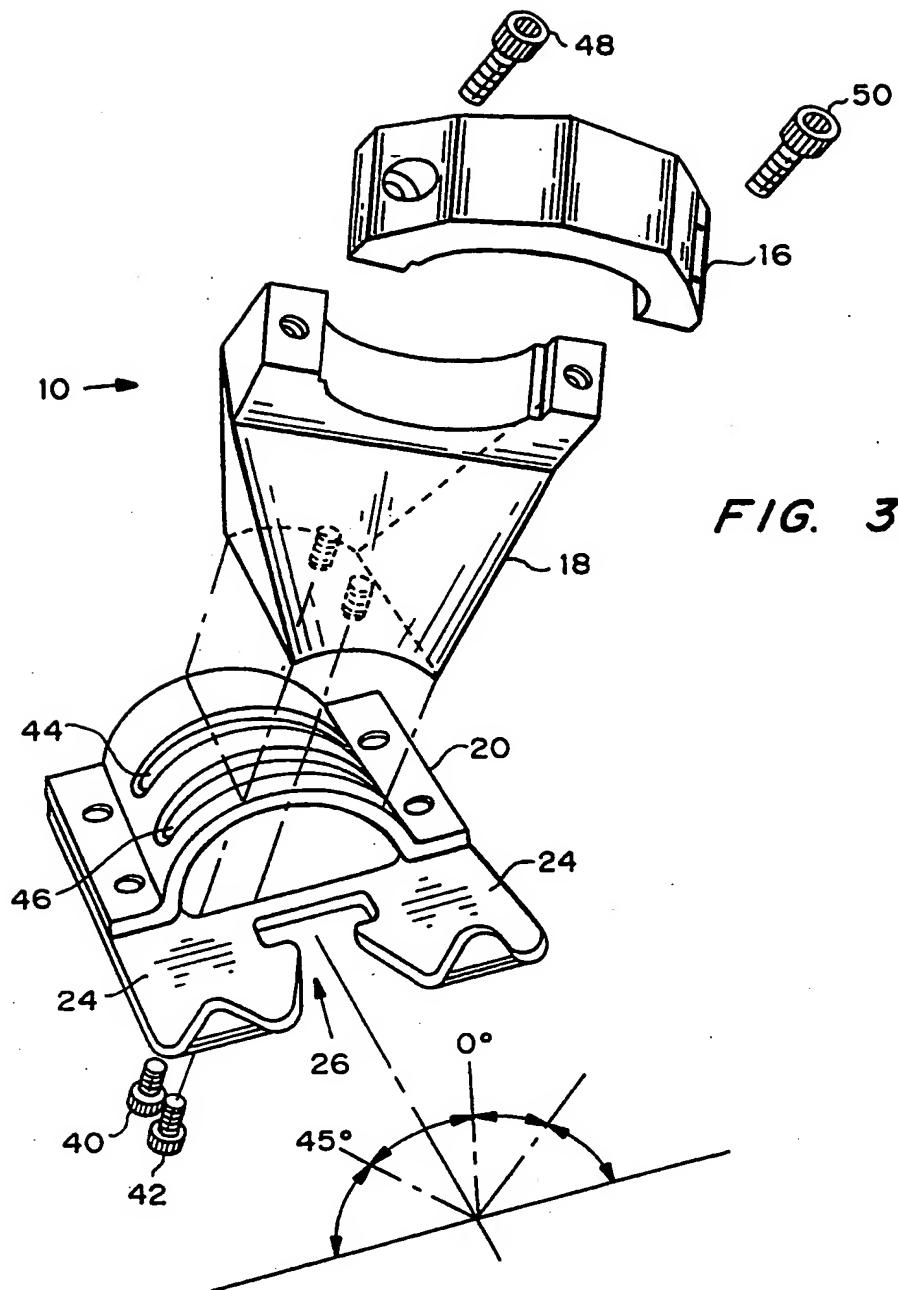
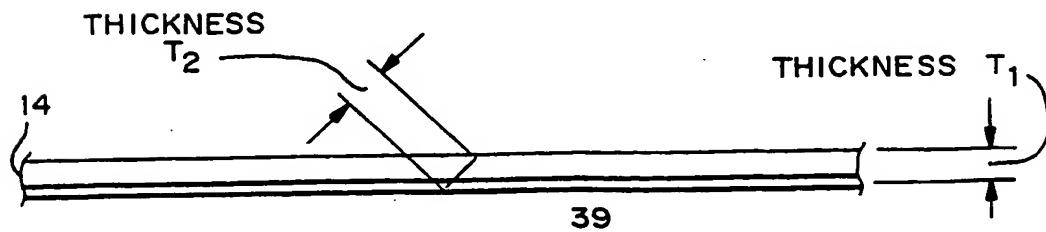
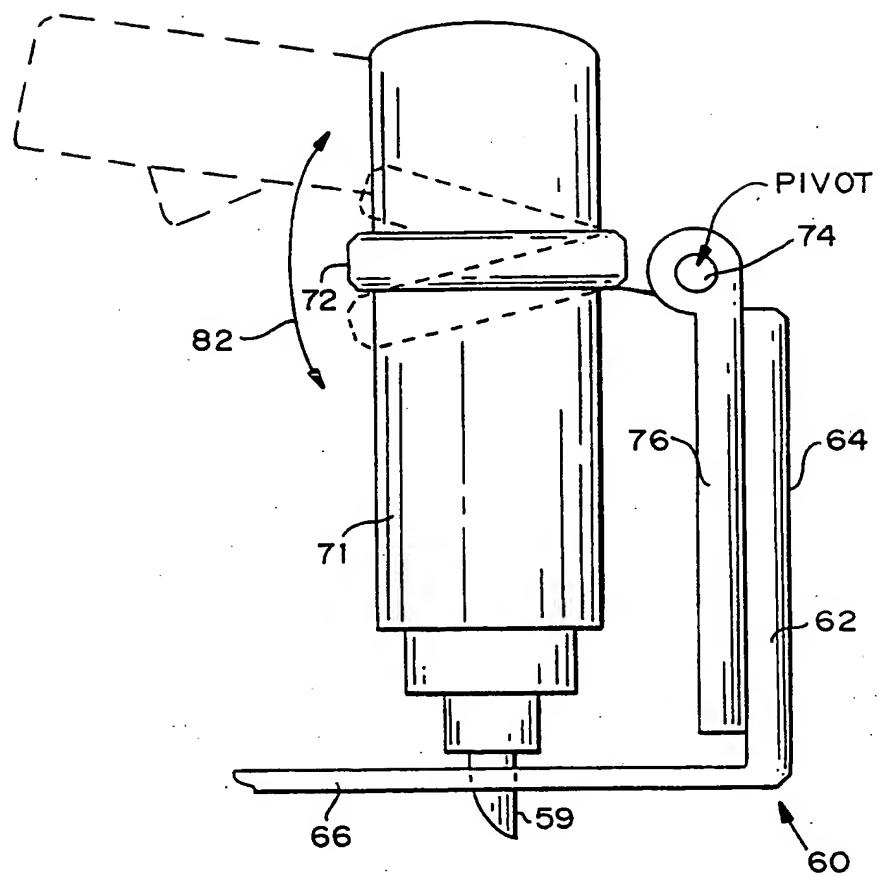


FIG. 3



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FIG. 4**SUBSTITUTE SHEET (RULE 26)**

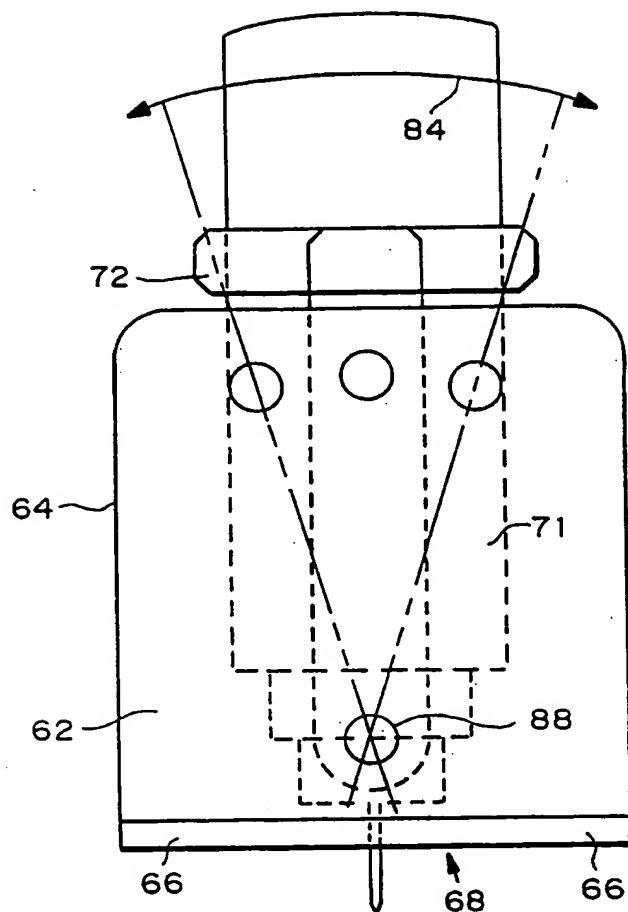


FIG. 5

SUBSTITUTE SHEET (RULE 26)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/14738

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :B26D 03/02, 05/08, 07/26
US CL :156/73.3, 304.5, 510; 7/103; 30/275, 293; 83/879, 56, 956
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 156/73.3, 258, 304.4, 304.5, 304.7, 510, 523, 579; 7/103; 30/275, 277.4, 291, 293, 294, 321; 83/879, 880, 881, 56, 956

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Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,317,943 A (DOWDLE) 07 June 1994, Abstract, col. 3, lines 7-21, col. 9, lines 21-34, line s62-68, col. 10, lines 1-45.	1-5, 13, 14
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Y		6-8, 15-21

Further documents are listed in the continuation of Box C.

See patent family annex.

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Date of the actual completion of the international search
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Date of mailing of the international search report

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